

MIRIAM WEINSTEIN WEBB  
DOCTORAL QUALIFYING THESIS

A DEFINITIVE CRITIQUE OF EXPERIENTIAL LEARNING THEORY

Candidacy Committee Approval

Dr. Frank Friedlander

Dr. David Kolb

Dr. Eric Nielsen

Department of Organizational Behavior  
Division of Graduate Studies  
Weatherhead School of Management  
Case Western Reserve University

Copyright:  
December 1980

Revision:  
July 2003

## THE DEFINITIVE CRITIQUE OF EXPERIENTIAL LEARNING THEORY:

### Phase Two: Learning Modes and the Four Stage Cycle

Miriam W. Webb

The research was begun in 1977 at the request of Dr. David Kolb, co-ordinator of Experiential Learning Theory (ELT), the Experiential Learning Cycle Model, its Learning Style Inventory, and adaptive competence instruments and measures. It was undertaken to substantiate the philosophical and epistemological underpinnings of the theory, i.e. to test for construct validity. The document was to have been published as part of a research project on Life Long Learning and Adult Development funded by the National Institute of Education, through the Department of Organizational Behavior. Weatherhead School of Management, Case Western Reserve University, Cleveland, Ohio. Although Kolb signed off on the research conclusions, the findings were not published. Neither was the theory amended to make it valid.

### ABSTRACT

The paper is the second phase of a definitive critique of Experiential Learning Theory and its hypothesized construct validity. A thorough examination of the intellectual and scientific roots of Experiential Learning Theory, its assumptions, and foundational references were analyzed to address three substantive questions fundamental to the theory. What is learning? Are the Experiential Learning Model modes separate and distinct in their functions so as to necessitate a four-stage cycle for learning to take place? Is dialectic tension the mechanism that mediates the relationship between the modes and between the person and the environment? Phases One of the critique concludes that Experiential Learning Theory's definition of learning is a dramatic distortion of the very epistemological fundamentals it references. Phase Three of the critique concludes that dialectic tension is *not* a viable mechanism for mediating modes of learning, and that the infrastructure of the Experiential Learning Cycle Model does not have construct validity. Phase Two of the critique addresses the foundational propositions of the model, experiential learning modes, their constitutive natures, and their place in relation to learning theory. It concludes that all four modes are *not* required for learning to take place, and demonstrates that this component of the theory is rife with inherent contradiction and inconsistency. The author suggests ways in which these contradictions could be resolved. The Critique concludes that the infrastructure of Experiential Learning Theory, its Model, and the Learning Style Inventory is faulty at the core, and recommends that the operational evolution of learning styles as a combination of contiguous modes of learning be re-evaluated.

## PHASE TWO

In their 1975 treatise on experiential learning, Kolb and Fry explain how Kurt Lewin's experiential learning model and its practical action research counterpart stimulated their initial research into learning. From Lewin's theory, which evolved out of his experimental work with T-Groups, Kolb and Fry sought to "elaborate four implications of the experiential learning process."

- 1) The integration of cognitive and socio-emotional perspectives on learning;
- 2) The role of individual differences in learning style;
- 3) The concept of growth and development inherent in the experiential learning model; and,
- 4) A model of learning environments that is commensurate with the experiential learning process.

Kolb and Fry, 75:33

Their strategy was to take the events circumscribing a T-Group intervention, and interpret those events as *constitutive factors* of experience-based learning which integrated cognitive and socio-emotional perspectives. Here is how they did it.

Lewin's fundamental thesis about learning in groups was based on his assumptions of *how humans change to fit social situations*. His work with groups began during the Second World War and his theory of group dynamics presents one of the earliest theories for social management brought about with psychological interventions. (Lewin, 51:193) Lewin contended that three things were required to reeducate the person toward social requisites: cognitive restructuring, modification of valences and values, and change in motoric actions or the repertoire of behavioral skills available to the person at a conscious level of bodily and socially prescribed movement. (Lewin and Grabbe, 1945) In other words, Lewin believed that humans change if they are

reeducated to think differently, judge and value differently, and behave or act differently. How to make these three happen became the goal of social management disciplines.

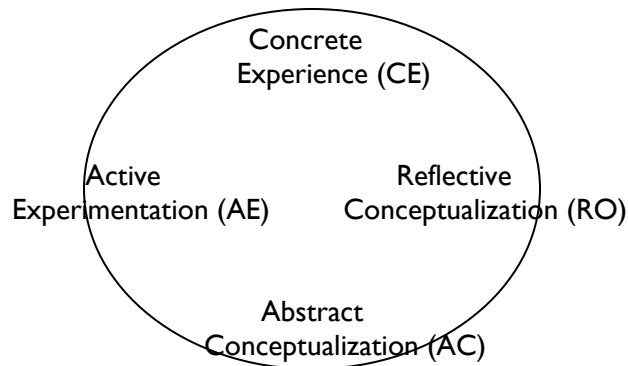
In the process of instituting a new design for leadership and group training in 1949, Lewin realized that a particular method of group intervention facilitated a person's reexamination of values and choices for action. This reexamination began when an observer to the T-Group (who by design was in a position of analytical detachment) drew attention to the ongoing immediate experience and behavior of the participant (who by definition was in a position of concrete involvement). This intervention was followed by an interpretation of the participant's experience by the observer, based on a particular analytical framework that the observer brought to bear. The analytical framework provided the participant with a set of concepts with which to evaluate experience in light of a pre-determined socially defined reality. It was assumed that from that evaluation the participant would then choose alternative forms of action, thereby transforming immediate experience into a new experience.

Lewin found that these events of reexamination and evaluation of immediate experience through the use of analytical interpretation tended to be stressful and at times riddled with conflict for the participant. This is common knowledge among T-Group facilitators. Later, Lewin characterized this process as a result of group "unfreezing, moving, and freezing" and the interplay of socio-emotional forces searching for psychological and group equilibrium. (Lewin, 51:228) The conflict was embodied in an *active dialogue* between observer and participant – two different perspectives by separate actors in a given situation. Eventually it was hypothesized that the analytical detachment and conceptual framework provided by the observer became integrated and

assimilated by the participant. What conflict existed was deemed beneficial for learning and the presence of these perspectives was deemed significant for the creation of *learning environment* in groups.

From this, Kolb and Fry discerned that Lewin had discovered the best environment for learning. They described this as an “environment where there is *dialectic tension* and conflict between immediate, ongoing experience and analytic detachment.” Kolb and Fry went even further to hypothesize that “learning is by its very nature a tension and conflict-filled process.” (Kolb and Fry, 75:35) The conflict is the result of confrontation between and among four different perspectives involved in experience-based learning, where the person is moving from concrete involvement with immediate experience to analytical detachment, from reflective observation to active experimentation with new behavior. The perspectives which Lewin presents as a model for experience-based learning in groups is now *translated* into a model to define and explicate experiential learning as nuomenon, a thing-in-and-of-itself, learning *qua* learning as it is manifested *within* the person. Hence, Lewin’s four *perspectives* become Kolb and Fry’s four *modes* of experiential learning. Learning is depicted as a four-stage cycle, requiring progressive *sequential* movement through each mode in order to be complete.

Kolb and Fry’s model of experience-based learning is represented as a cycle:



Embedded in the model are Lewin's four perspectives, originally representative of two different actors in a group. *Now these perspectives are represented as four different modes for transforming experience.* In 1979, Kolb's research team expanded the definition of learning to include the "assimilation and accommodation of experience into understanding and behavior." (NIE White Paper, September 1979) How this cycle works to create learning is explicated in the same document.

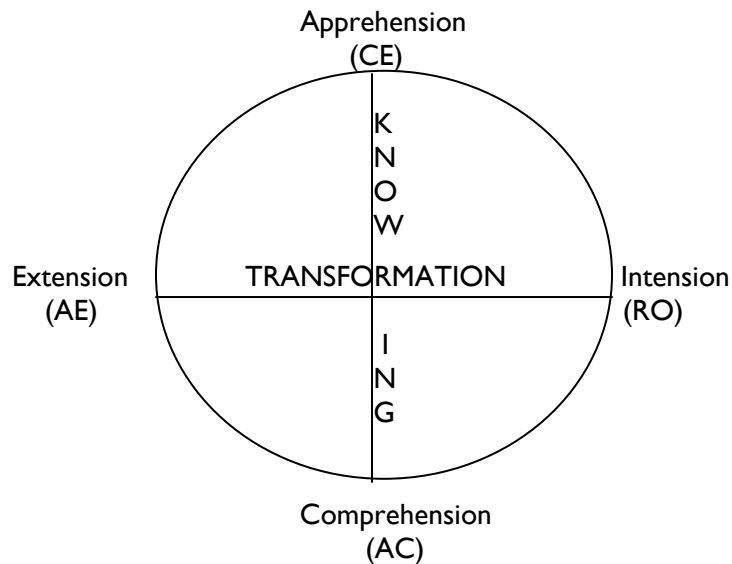
Concrete experience is translated into reflective observation. Reflective observation is translated into abstract concepts, and abstract concepts lay the ground for active experimentation. The entire four stages of the cycle are required for learning.

(NIE White Paper, 79:2)

Kolb and Gish expand the definitions of the four modes to include processes of *either knowing or transforming experience.* Concrete experience and abstract conceptualization are placed on a continuum of knowing, wherein concrete experience represents the *apprehension* of immediate experience, and abstract conceptualization the *comprehension* or ordering of experience through the creation of concepts. Reflective observation and active experimentation are placed on a continuum of *transformation*, wherein reflective observation represents the *intension* or movement of experience inward toward the person to generate Meaning, and active experimentation represents *extension* or movement of experience and concepts outward toward the environment to test their implications. (Gish, 1979)

Gish amended the model to represent these dimensions. Although the cycle appears closed, it is meant to represent interaction with an environment. Now the cycle is bifurcated, split by two radii. These radii represent the two continuums of

knowing and transformation which have been created by the dialectic tension existing between opposing modes.



In 1975, the dialectic tension had been employed by Kolb and Fry to depict the active dialogue inherent in Lewin's T-Group intervention. By 1979, dialectic tension is inherent within the learning cycle, representing the environment of conflict requisite for learning to take place. The dialectic tension also has within it a mediating mechanism through which the conflict between the modes gets resolved.

It is the contention of Experiential Learning Theory that the dialectic between concrete and abstract is resolved via a transformation process involving either reflection and/or action. It is also hypothesized that the dialectic between reflection and action is resolved via either concrete experiencing or abstract conceptualization.

The creative tension which precipitates these dialectics is a function of the interaction between the person and the environment. It is the choices made by the person which dictate how he or she adapts to the environment...As the person moves through the learning cycle, certain stages become predominate or become preferential modes of interaction with the environment.

NIE White Paper, 79:2

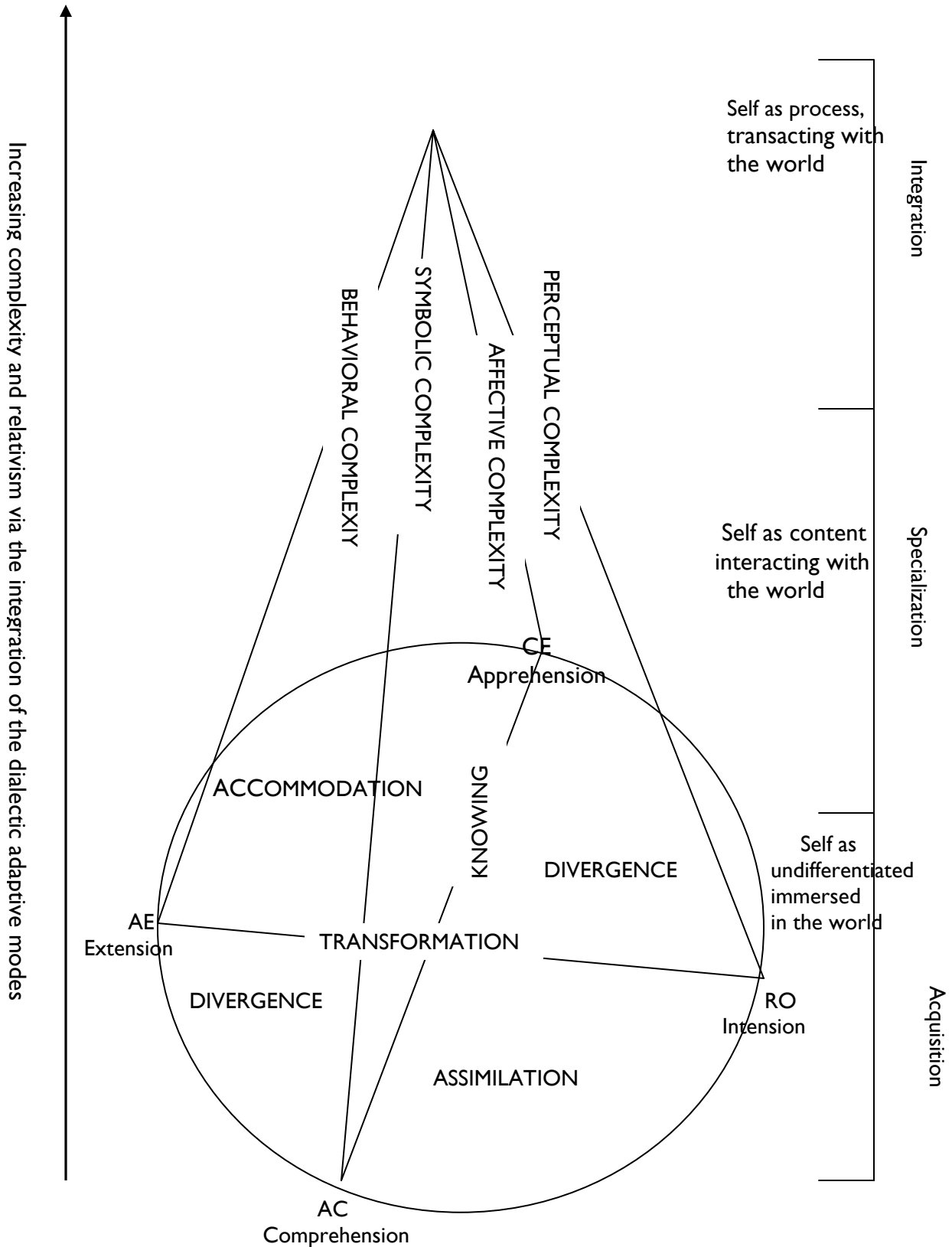
Here adaptive choices are linked to learning styles or preferential modes of interacting with the environment. Learning style is a combination of contiguous (adjacent) modes. It is through a *style of learning* that the person adapts.

Finally, Experiential Learning Theory hypothesizes that the four separate modes represent aspects with specific structures and behaviors. Concrete Experiencing represents *affective* structures and behaviors. Reflective Observation represents *perceptual* structures and behaviors. Abstract Conceptualization represents *symbolic* structures and behaviors. Active Experimentation represents *behavioral* structures and behaviors. As each mode increases in linear complexity, these corresponding structures, behaviors, and psychological adaptations increase in complexity as well. The model of Experiential Learning Theory Growth and Development is represented in Figure 1.

---

To summarize then, we now have a description of learning which involves four sequential operations performed on experience. This represents a cycle of experience-based learning. The cycle is depicted as filled with conflict between the various operational modes. The mechanism which holds this conflict steady and ultimately resolves it, is dialectic tension existing between each oppositional pair of modes. Each two of the four oppositional modes comprise a dialectic continuum. They are opposing operations or polarities of the same fundamental activity. These dialectics hypothetically result from the creative tension between the person and the environment. That creative tension emanates from *choices* the person makes in assimilation and accommodation of experience.

Figure 1: The Experiential Learning Theory of Growth and Development



The person is said to choose a preferential combination of modes with which to relate to the world. Each preferential combination of modes is now defined as a *learning style*. Relating to the world is portrayed as synonymous with adaptation. The dialectics which form from these adaptive choices somehow resolve the internal confrontation between the knowing and transformation modes of learning. Hence, the process of learning is now governed by adaptive choices. Learning can now be understood as an adaptive process. Hence, what is true of learning must also be true of adaptation, and what is true of adaptation can be assumed to be true of learning.

From this foundation, Experiential Learning Theory builds an elaborate set of propositions describing learning styles, adaptive styles, learning and adaptive developmental continuums, and environmental *presses* congruent with learning style definitions. Adaptive competence is now defined as synergistic congruence between adaptive orientations and environmental press. Adaptive orientations are significantly similar to learning styles.

From this last has emerged an entire network of theory and empirical methodologies to differentiate and describe work and learning environments to parallel and promote preferential learning styles. By making learning an adaptive process, it is also possible to hypothesize how socio-emotional factors determine learning. Socio-emotional factors are no longer understood to merely influence learning activities or outcomes. Now they are determinate factors in how learning takes place.

It is at this juncture that the second question in the research must be addressed. Are Experiential Learning Theory modes separate and distinct in their functions, so as to necessitate a four-stage cycle for learning to take place? The research will not

address the validity of assumptions proposing the determinate nature of socio-emotional factors to learning. A separate inquiry is recommended for that.

### Concrete Experiencing

In its most primitive form, concrete sensing and experiencing is the constitutive capacity within the person to sense, feel, absorb impressions and sensations through the organs of sense. These are primary faculties with which humans take in or grasp the material realm of objects, events, sensations. These activities are continuous. They underlie every moment of living. They are pre-conceptual, pre-operational, and pre-formative. Concrete sensing encompasses sensory excitation and the rhythmicity of that excitation, its ebb and flow, expansion and contraction. (Keleman, 75:113) To be in the mode of concrete experiencing is to be in the mode of receiving – simply taking in, prior to screening, prior to naming, prior to voluntary movement. In its elemental form, concrete experiencing is involuntary, biological, and autopoietic.

Experiential Learning Theory's description of concrete experiencing is not one of simple sense perception. It is one of apprehension. Apprehension is defined by Webster's as "1) the act of learning; 2) the faculty of grasping with the intellect: understanding." Apprehension involves a "perception that is comparatively simple, direct, and immediate and has as its object something considered to be directly and nondiscursively understandable." Kolb and Fry explain concrete experiencing in the adult learner as the "ability to involve himself fully, openly, and without bias in new experience." (Kolb and Fry, 75:37) In this context, concrete experiencing cannot be known or talked about except through *direct referencing*, utilizing other constitutive capabilities, including adaptive choice. Gendlin contends that humans can only talk of

raw, present, ongoing experience by creating symbols which refer directly to the activity going on. (Gendlin, 62:45 ) Clearly, Experiential Learning Theory's definition of concrete experiencing is already enhanced by functional aspects from *other modes*.

Concrete experiencing, as the taking in of raw, unstructured sensation does not involve learning or any sort of coherent mediation, in either infant or adult. As the human develops, however, it does appear that concrete experiencing calls on more complex activity. According to Kohler, concrete sensing becomes an *organizing process* for apprehending sensation. This organizing process involves the *recognition* of segregated objects in a field, and their *integration* into some kind of coherent configuration. This coherent configuration is actually an *ordering of sensation*. It is the activity whereby experience becomes comprehensible as distinct from raw sensation. Continuous transformation of sensation results from definite psychological stress exerted upon a sensory field by processes originating in other parts of the nervous system. This disturbance may cause one organization of the field to yield to a new configuration. (Kohler, 29:184) The equilibration of a field is a *predetermined* structural configuration. Gestalts are formed or sensory field organized in the same way with every new configuration.

What Kohler provides is an explanation of concrete experiencing that can be closely linked to that of Piaget. Kohler's contention is that the formation of gestalts or equilibrated forms in any given field requires the organized activity of a subject upon an object that changes, and becomes more complex as the field is disturbed or as gaps in the configuration occur. Recognition of this, however, involves perception. The Gestalt position makes it difficult to delineate affect from perception. Furthermore, Kohler

proposes that learning actually takes place once the traces of the organizing proceeds are imprinted in the nervous system.

Piaget criticized Gestalt psychologists for making configurations a constitutive factor of the organization of a field itself, rather than allowing for constant creation of new relations in a field. His discussion of concrete experiencing and apprehension is not simplistic. In the more primitive forms of sensor-motoric activity, the forms which evolve are more diffuse structures in that the subject is *not differentiated* from the object. As a geneticist, Piaget must take the position that all forms and structures are continually evolving, changing, building on one another. Each state of equilibration between the assimilation and accommodation of experience is an evolutionary form evolving from less complex to more complex, and improved structures. Simpler forms lay the ground for construction of more complex forms. That which causes the breaking up of one equilibration is a non-balance or disturbance which emerges as the need to integrate negative characteristics with positive characteristics. (Piaget, 75:15-19)

The equilibrations are slowly developing and may involve complex regulations. Every aspect of Piaget's theory of cognitive development involves both an operation or structuring activity and a figure, i.e. the structure formed. These are represented *simultaneously* in every phase of cognitive development. Schemes arise from *relations* between activities on objects *and* the subject as actor. These schemes are both figure or structure, and the evolving activities which form them.

Initial assimilation schemes are innate, genetic, and few in number. These include sucking, looking, listening, and touching. These activities are sensori-motoric in nature. Piaget demonstrates that concrete experiencing involves *intentional prehension*, or

movement directed toward an object. Piaget proposed that sensori-motoric activity is manifested in six developmental stages or levels, each caused by a disturbance in the activities which make up the schemes through which experience is assimilated. The earliest schemes are innate, arising from a central coordination of action in the central nervous system. These schemes are *not* coordinated relations. They do not involve differentiation between the subject and the object. There is no visual causality. Causality is only tactile, kinesthetic. (Piaget, 75:87) These early habits are the most elementary constructions which consist of “novel actions which are integrated into innate schemes as they continue to be performed.” (Piaget, 75:89)

Less primitive stages emerge from disturbances in actions that must be assimilated into a scheme, with accommodation being made to an object. Now coordination takes place not only between schemes, but also between reciprocal assimilation of schemes. Piaget gives the example of such reciprocal assimilation of schemes as those which link both vision and hearing. (Piaget, 75:90) The equilibration of these early sensori-motoric schemes is the fundament for all six stages of sensori-motoric development. Later stages incorporate perception, activities which clearly delineate the object from the subject-actor, including recognition, reciprocal assimilation, and symbolic representation.

Experiential Learning Theory likes to draw parallels between its experiential learning model and Piaget’s stages of cognitive development. (Kolb and Fry, 75:43) From each of Piaget’s developmental stages, Experiential Learning Theory extracts a conceptual framework with which to characterize each of the four modes of the experiential learning cycle. The point in respect to Experiential Learning Theory’s

conception of concrete sensing and experiencing is this. Concrete sensing and experiencing involve human action upon objects and perceptions of schemata which, though not named or labeled, are both prehensible and perceptual. These operations involve regulation and compensation, and are complex in their organizing activities. When Kolb and Fry define concrete experiencing as “concrete involvement in experience”, they are going far beyond both epistemological and psychological definitions of concrete experiencing. Piaget is clear that the capacity for concrete sensing is sensori-motoric, requiring actions upon objects as well as passive receptivity of sensation. Both Piaget and Kohler demonstrate that however primitive concrete experiencing may be initially, as the infant grows, the operations of sensing and observing are inextricably linked. Physiological optics contends that perception involves both concrete sensing and reflective observation. It is not a linear or isolated function.

Hence, when studying adult learning, one must assume that the innate sensori-motoric operations are part of much greater and improved schemata that involve both sensing, experiencing, and observing (differentiating subject from object), i.e. perception. This leaves Experiential Learning Theory with the dilemma of explaining how functionally interrelated modes can operate alone, particularly in the adult. What is involved is clearly reciprocal assimilation and coordinated accommodation of schemes that are sensori-perceptual.

As an oppositional mode (to abstract conceptualization) on the model's transformation continuum, concrete experiencing cannot be *both* independent of perception or apprehension *and* at the same time an adaptive choice. To be both simultaneously contradicts Experiential Learning Theory's assertion that each mode of

learning is a separate and distinct function. It cannot have it both ways. The contradictions inherent in defining concrete experiencing at this stage of the cycle become even more apparent as one examines the next mode in the sequence, reflective observation.

### Reflective Observation

Although there is evidence in both the Gestalt and Piaget framework that *learning does emerge* with sensori-motoric and sensory-perceptual activities (including simple and conditioned acquisition), Experiential Learning Theory contends that it does not. According to its starting premise, experience and sensation must continue through four stages of transformation in order for learning to take place. Reflective observation is the required next stage. It is defined as the development of perceptual structures and activities. Reflective observation consists of watching and thinking about experience from several perspectives or schemes. From watching and thinking about experience, perceptual structures emerge.

What exactly is involved in watching and thinking about experience? According to Piaget, the capacity for observation involves differentiation of subject as actor from object in a field, using the capacities of centration, decentration, perceptual coordination, figure formation, and other optical-structuring activities. Piaget delineates as many as ten various perceptual activities. These combine to create topological (spatial or graphic delineation) structures for deciphering figural representations or objects. (Piaget, 69:203+)

The primary perceptual activities that comprise observation in Experiential Learning Theory must be simultaneous with the earliest field effects. That is, primary

perception requires immediate interactions between elements which are simultaneously perceived as in a single field of centration. (Piaget, 69:133) These primary perceptual activities begin to emerge in Stage VI of sensori-motoric activity. Where Piaget contends these structuring activities emerge in the final stages of sensor-motoric activity, Kohler contends that they take place simultaneous with the initial contact.

Once again, Piaget proposes that primary perceptual activities involve both operational activities and figure formation. Figural aspects of primary perceptual activity are defined as the perceived states of objects or events, i.e. the total configuration or outcome. Operational aspects of primary perceptual activity are defined as transformations of field effects into structures and constructs. (Piaget, 69:203)

Operations are action or systems of bodily movements which are internalized in thought activity. Actions are structured. Primary perceptual activity includes the formation of figures (observation) *and* the internalization of both the figure formation and the pattern for structuring that figure, i.e. the structuring activity. *No cognitive form emerges without these simultaneous activities.* Observation, then, is the giving of form to concrete sensing. “Thus there do not exist cognitive states such that their content is attained without the intermediary of forms and from perception onwards, perceptual schemes (gestalts, etc.) give form to sensorial content.” (Piaget, 66:246)

Reflection involves both equilibration of assimilated schemes (an interiorised operation) and accommodation to the object. Piaget explains that deductive or conclusive operations consist of interiorised and coordinated actions of classifying, ordering, enumerating, and the like, rather than the simple application of logic. (Piaget, 69:358) With deduction operations, humans not only ascribe name and content to a

figural representation, but also *relational* qualities to a figural representation. Humans also acquire the *capacity to coordinate* primary perceptual activities so as to correct for perceptual illusions and errors.

Piaget clearly offers a far more complex understanding of reflection than Gendlin, Dewey, or James. Gendlin contends that with reflection, the configuration of sensory data acquires *meaning*. It becomes content. Sensory data becomes objectified through the application of a cognition. (Gendlin, 62:329) Reflection involves the acquisition of Meaning largely through association and repetition. But these assumptions do not address mechanism, i.e. how cognition is attached to sensory data. Only Piaget attempts to unravel this mystery by ascribing an operational nature to reflection. The creation of meaning becomes another structuring activity involving equilibration of schemes, and reciprocal assimilations to form relational structuring capabilities. In this way, Piaget contends that reflection lays the ground for logical, mathematical thought, and other forms of abstract conceptualization.

Experiential Learning Theory contends that concrete experiencing and sensing provides the necessary input for reflective observation. That input becomes Meaningful according to normative requisites, as the Meaning that is ascribed to experience is socially constructed and culturally determined. Reflection involves the making of choices as to the best meaning to ascribe to a given input. In Mead's terms, meaning is derived from a situation in the environment. (Mead, 38:215) Reflection is interpreted as an adaptive process.

Piaget takes a different view. Whereas the input which may be assimilated is external to the person and may involve several schemes, the activity involved in

reflection requires cognitive construction within the person. The construction of cognition involves equilibration and compensation. It is not a simple matter of conscious choice. Rather is a complex matter of cognitive construction and transformation. Every construction,

...consists in the elaboration of operations dealing with the preceding constructions; there are relations of relations, regulations of regulations, etc. In short, new forms deal with previous ones and include them as contents. This elaboration remains essentially *endogenous* [within the person] even if an equilibrium between the subject and the objects remain constantly necessary, for the contributions from objects requires either an input from forms, from operations applied to them, or from systems of coordinations or operational compositions attributed to them.

Piaget, 75:179

Hence with reflection, experience (which has been given form through observation) is transformed further through coordinated structural activity which, (1) ascribes schemes to the configurations; (2) interiorises those schemes and the relational qualities which they generate in relation to objects and other schemes; and, (3) interiorises the structuring activities and transformations which are the fundamental operations of reflection.

With reflective observation, experience is given form and meaning. The human acquires formative structuring and constructive activities. Experience is mediated through the *faculty of perception*. It is transformed. Piaget contends that perceptions function as *connectors* which establish constant and local contacts between actions and operations on the one hand, and objects and events on the other. (Piaget, 69:359)

*Perceptual messages are transmitted in figurative form and are decoded by becoming part of the system of transformations.* Hence figure becomes structuring activity becoming figure

becoming structuring activity, and so on, building more complex and improved configurations and constructive transformations.

Experiential Learning Theory contends that reflective observation is intension, the turning inward of experience toward the person to generate meaning. This linear directionality contradicts what both Dewey and Piaget propose perception to involve. Dewey contends that perception is both intension and extension. He distinguishes between meaning which is definitional and individualized to particular figures as interiorised and intension. Meaning that is divisional and classificatory of groups of like-figures is projected out unto objects. This type of perception is extension. (Dewey, 10:130). Though Dewey does not delineate the operations that make ascribing meaning possible, Piaget does.

The grouping and classifying of relations represent extension-type perceptions, where transformed experience is projected unto objects. Piaget calls these *actions performed on objects*. Piaget uses the term *empirical reflection* to describe a more intension-type perception. Empirical reflection is the derivation of common characteristics from a class of objects and generalizing from them.

By theorizing that reflective observation and perceptual activity is directed only inward toward the person, Experiential Learning Theory does not account for constructions which transform experience through relational projections out unto objects. Cognitive operations performed on objects are as much extensive as active manipulation of objects. Furthermore, cognitive operations performed upon objects are partially instrumental in generating abstract conceptualization.

By the time perception, reflective observation, evolves in the person, experience has been mediated through several capacities of consciousness resulting in some form of knowing. Learning has, in fact, taken place. Meaning is available. Relational constructivistic cognitive structures are available. The capacity for association and reciprocal assimilation of various schemata are available. Conditioned, as well as simple, acquisition becomes possible.

Experiential Learning Theory proposes that experience-based learning must move through two additional stages, Abstract Conceptualization and Active Experimentation. Yet, it is becoming clear that learning, as an activity that mediates experience through capacities of consciousness resulting in coherent forms of knowing, takes place with reflective observation. Empirical reflection, in particular, as a structuring activity that performs operations on objects, involves learning, even if only in a rudimentary form. The difficulty that Experiential Learning Theory encounters here, and throughout the model, is contradiction with how humans know. When one takes in experience or sensation and ascribes meaning to it, one is already learning. Empirical reflection as operations before upon objects is already a form of what Experiential Learning Theory calls active experimentation. Hence, reflective observation is *both* a transformation and a knowing function of consciousness.

It is also important to note that these same conclusions apply to socio-emotional experience. Socio-emotional experience must be perceived, given form and meaning, just as all other kinds of concrete experiencing. The difficulty that Experiential Learning Theory encounters results from assuming that socio-emotional learning *must result in behavioral change* in order for learning to be complete. Socio-emotional experience,

however, can be recognized and cognized through structuring activity without behavioral change taking place. Introspection, which is considered a psycho-emotional capacity, is an immediate function of perceptual structural transformations of socio-emotional experience. As such, it results in association, memory, and recognition. Each of these constitutes a form of knowing, and an activity constitutive of learning.

### Abstract Conceptualization

Experiential Learning Theory hypothesizes that perceptions must be transformed into symbolic structures and activities in order for learning to progress toward completion or closure. What are the transformational activities involved in abstract conceptualization? Experiential Learning Theory contends that abstract conceptualization is on *knowing* continuum and represents *comprehension*.

Comprehension is defined as the ordering of experience through the creation of concepts. (Gish, 1979).

According to Webster's, to comprehend is to "see the nature, significance, and meaning of", to grasp mentally and attain knowledge. If comprehension results from abstract conceptualization, then it is problematic to suggest that learning does *not* complete itself at this stage. Certainly comprehension is a form of knowing which involves learning. If one accepts, as Experiential Learning Theory proposes, that knowing does not evolve until the Experiential Learning Cycle is complete, then one must question whether apprehension and comprehension are forms of knowing to the exclusion of reflection and experimentation.

Whereas comprehension is a function of intellect, knowing is a function of *both* primal and cerebral capacities of consciousness. One can comprehend without

knowing. One can apprehend without knowing. These two are not *opposite forms of knowing*, or as Experiential Learning Theory contends, two oppositional ends of a knowing continuum. Knowing requires *both apprehension and comprehension working in consort, at the same time*. By bifurcating these functions of consciousness, Experiential Learning Theory diminishes the requisite interconnected of their activities in creating knowledge. Knowledge, as a form of knowing, is the result of learning.

Clearly, however, there is a progression from reflective observation to abstract conceptualization, as the Experiential Learning Cycle depicts. Abstract conceptualization cannot emerge as separate from perception. The structures and operational activities interiorised through reflective observation provide the foundation for more complex cognitive operations. Hence reflective observation and abstract conceptualization are actually different phases of the *same sets of cognitive activities*. They cannot successfully be depicted as separate and distinct in nature, for they are part of the same capacity of consciousness.

The difficulty in defining abstract conceptualization as the ordering of experience through the creation of concepts is that this definition obscures the diverse nature and complexity of abstract thought. Abstract thought or reasoning takes several forms: intuitive abstract reasoning, logico-mathematical reasoning, and logical analysis. Piaget and Wertheimer again describe how abstract conceptualization arises out of structuring activities and the formation of figures.

Wertheimer describes these activities as *gestalts*, which form the configuration of cognition. These *gestalts* undergo transformation as they encounter gaps or

disturbances in their internal structural relations, related to functional requirements of a situation.

Thinking consists in envisaging, realizing structural features and structural requirements; proceeding in accordance with, and determine by, these requirements; thereby changing the situation in the direction of structural improvements...

Wertheimer, 45:190.

These structural re-arrangements include operations of transposability, structural hierarchization, separating structurally peripheral from fundamental features, structural grouping and segregation, and the forming of new gestalts. Piaget and Wertheimer both contend that the forming of configurations and the activities which transform structures begin to emerge, however, in the activities of reflection and perception.

Piaget clearly describes three kinds of structures that result during abstract conceptualization. Logical analysis involves the formalization of thought through deduction. Syllogisms result. These formalization mental activities involve the mind reflecting upon objects and classes of object. Piaget calls this *empirical abstraction*, and it is an extension of the empirical reflection he describes as emerging with perception. Intuitive reasoning is the second form of abstract thought Piaget delineates. Intuitive reasoning involves the creation of symbols and relationships between assimilated schemata for which a basis in reality *need not necessarily exist*. Intuition, it will be recalled, is the ground from which a priori ideas emerge. Intuitive reasoning can generate formal models, which eventually may be transposed into materiality. The most definitive example of intuitive reasoning is geometry, where the postulates upon which geometric deductions are made come from axioms grounded in intuition. This holds true for both Euclidean and non-Euclidean geometry.

The third form of abstract thought which Piaget delineates is logico-mathematical reasoning. Formal structures of logic extend themselves into new forms of logical structuring. Mathematical reasoning is capable of carrying logic beyond itself into higher logical forms, what Russell labeled *logical types*. (Beth and Piaget, 66: Chapters I, II, III). Mathematical reasoning is considered the most complex form of abstract thought, and it requires what Piaget terms *reflective abstraction*.

...reflective abstraction consists in deriving from a system of actions or operations at a lower level, certain characteristics whose reflection (in the quasi-physical sense of the term) upon actions or operations of a higher level it guarantees; for it is only possible to be conscious of the processes of an earlier construction through a reconstruction on a new plane. This fact is not peculiar to scientific transition from a hierarchical stage to one following it. In short, reflective abstraction proceeds by reconstructions which transcend, whilst integrating, previous constructions.

Beth and Piaget, 66:189

Mathematical reasoning builds from the structures of natural thought through reflective abstraction. Mathematical reasoning is neither exclusively empiric nor aprioric. Here Piaget makes his strongest argument for genetic epistemology. The central coordination of structuring activities in the central nervous system is presented as the source of a priori idea, as well as first cause. Although certain forms of mathematical logic may derive from either introspection or conscious realization, these forms emerge from operations performed on lower level constructions, resulting in more complex structures on a higher level of constructive activity. Integration, for Piaget, involves “the enlargement of the general framework giving it unforeseen flexibility and conservation of the preceding frameworks as particular cases.” (Beth and Piaget, 66:195)

Abstract conceptualization, then, involves a series of transformations and figure formations that have the capacity to raise the level of logical cognition. Raising the level of constructive activity is a function of reflective abstraction, and not a function of adaptive choice or style integration, as Experiential Learning Theory hypothesizes. Reflection abstraction, as a particular function in abstract thought, is a form of constructive operation which raises the level of cognitive *capacity*, and with it the level of structural formation in general.

Experiential Learning Theory portrays abstract conceptualization as a mode of comprehension through application of symbols and the building of models. Indeed, the application of symbols and the construction of models transforms experience toward some form of knowing. But, Piaget demonstrates that these are not the *end* of abstract conceptualization. Rather the application of symbols and the building of models is part of an evolutionary activity whereby greater and greater complexity in constructive activity and figure formation takes place.

For the development of structures for intuitive reasoning, logical analysis, and mathematical reasoning, constructive transformation activities emerge from the foundations of earlier constructions. With these more complex constructions and constructivistic activities, it becomes possible to comprehend sensuous intuition, and those ideas which Kant described as finding their “element *in* experience but are not *of* experience.” (Kant, 1789) Hence, cognitive psychologists would claim that closure, or units of knowing, i.e. knowledge, actually occurs following abstract conceptualization, and with it, learning. But Experiential Learning Theory, in an attempt to integrate behaviorism with genetic epistemology, theorizes that learning does not attain closure

until it has passed through one more requisite transformation, that being, active experimentation.

### Active Experimentation

Experiential Learning Theory describes active experimentation as the testing out of symbolic logic and model from through abstract conceptualization, in order to assess their applicability and validity. Active experimentation is portrayed as a mode of extension wherein experience is turned outward toward the environment to test for implications. (Gish, 1979) Taking its lead from Lewin's experiments in T-Groups, active experimentation involves testing out new social behaviors and choosing new behaviors or experiences. The broader purpose of active experimentation is the materialization of abstract thought. And the underlying assumption is that abstract thought, mathematical logic, and intuitive reasoning do not represent learning *until* given determinateness through materiality, that is being brought into the realm of empirics.

With active experimentation, Experiential Learning Theory attempts to achieve three purposes. First, it attempts to integrate a sort of *behavioral pragmatism* with the theoretical bases of genetic epistemology and association theory. Second, it attempts to define the goal of learning as functional adaptation, that is learning as adjustment and modification of behavior and action to conform to normative requisites. Third, it attempts to isolate learning, as a noumenon, to those activities that only take place in the material, empirical realm.

If it assumes that learning cannot take place until abstract concepts, symbols, and models have undergone active experimentation, then one must account for the full range of abstract conceptualizations that, in fact, have no basis in materiality. Are we to

arrive at the conclusion, then, that concepts given in intuition and the higher levels of abstract reflection are never really learned? Such concepts have no form in materiality, and can only be actively experimented upon in the realm of thought itself.

The position of behavioral pragmatism is that the person cannot be understood separate from the social situation or environment in which the person is embedded. In other words, persons qua persons are determined by the social situations in which they exist. Therefore, learning and cognition are instrumental in the person attaining a proper fit to a given social situation. Cognitive operations become

...a phase of conduct within which conflicts between reactions are met by reorganization of the environment and of the tendencies within the organism to respond to it – the validity of reorganization...being tested by the success for the reorganization.

Mead, 38:361

Cognitive reorganization is dependent upon the testing out of schemata in the social context. The success or failure of the schemata is determined by the degree to which it fits the requirements of the social context. Cognitive structure is thus socially determined, reciprocally re-enforced.

The behavioral pragmatic stance runs counter to Piaget, Wertheimer, and Jung, who contend that cognitive, psycho-socio-emotional equilibration of structures and configurations is inherent in the nature of the organizing activities themselves. Whether or not a configuration fits the requisites of a social situation may or may not determine the equilibration of the constructivist transformation activities taking place. Whether or not psychological integration fits the requisites of a social situation may or may not determine the integration of unconscious with conscious psychological types. Social fit

is *not necessary* for cognitive, sensori-motoric, and psychological equilibration to take place.

The significant question in respect Experiential Learning Theory's proposition on learning qua learning, is whether or not active experimentation is a prerequisite for learning to take place. Must transformed experience be tested out in social situation before forms of knowing can emerge and be recognized for humans to learn? It has been demonstrated in previous sections on the first three modes in the cycle, that learning is actualized during aspects of concrete experiencing, reflective observation, and abstract conceptualization. What may be required beyond abstract conceptualization is a mode for the *expression* of knowledge, at minimum, that knowledge which can be exteriorized.

Expression of knowledge may be necessary to make that which has been learned *known to others*. To make knowledge public. To materialize forms of knowing. To demonstrate, present, produce, perform. This may involve a multiplicity of expressive forms. One form may be active experimentation. Another may be design and construction of models. Expression of knowledge may take the form of art, music, literature, and the like. All of these activities of expression outward toward the environment are extension. They are directed out from the person and they transmit that which has been formed and transformed. Clearly in active expression, transmission also transforms. It makes what is non-material and interiorised, material and exteriorised. However, even in the transmission and transformation of active expression, the *essence of knowledge and that which has been learned* remains within the person, an object of interiorisation.

This is particularly true of psycho-socio-emotional learning. It is still a matter of controversy between behaviorist and non-behaviorist psychologists whether or not an alteration in a person's outward social interaction to fit a social requisite (adaptation) creates a structural adjustment or re-arrangement of internal psycho-emotional configurations in consciousness. All that is clear is that a change in outward, externalized motoric action is taking place.

Furthermore, the kind of knowing that emerges from psycho-socio-emotional learning is the most difficult to materialize or test out through social experimentation. This kind of knowing cannot be fully expressed or materialized, for it resides in a realm of consciousness that links the primal and cerebral dimensions. Its primary form of expression is intension, directed in toward transformation of the psyche. Jung understood this in his theory on the integration of psychological types and collective unconscious. Psychological type integration occurs when the less dominant traits, which are submerged in the unconscious, emerge and become assimilated with the more dominant traits already in the conscious. The result is a psychological balance within the *character structure* of the person. A psycho-emotional, psychic-emotional balance. (Jung, 1923)

This kind of interior expression of a form of knowing creates an internal coherence within the person. It may very well be that some form of active expression is required for the person to fully gain coherence or closure. This internal psycho-emotional and cognitive coherence is not dissimilar to the equilibration proposed by Piaget. It must be acknowledged, however, that this kind of self knowledge can never be fully communicated to an other. Laing confirms this to be especially true of psycho-

emotional and psycho-social phenomena. With all of the literature devoted to psychological transformation from Freud through Skinner, *the essence of the experience transformed in the psycho-socio-emotional realm remains internal to the person.*

Association theory, psychoanalysis, interpretations made from behavior, and psychological testing – all of these merely provide *inference* in respect to core transformations in psychological, social, and emotional learning. The full knowledge that results from such forms of learning, regardless of how the psycho-socio-emotional experience is transformed and mediated through faculties of consciousness, still remains fully known and understood by the person, within the person.

Closure on these kinds of configurations may be facilitated through one of several modes of active expression, from verbal admission or active behavior extended outward to others, to forms of kinesthetic recognition which takes place in the freeing up of bio-energetic muscular blockages. Other modes of active expression of psycho-socio-emotional configurations may take the form of dreams and psychological reflections directed inward, toward the self. The forms of active expression of psycho-socio-emotional knowing and learning are both extensive and intensive. They are multiple ranging from simple to complex. The active expression of these forms of knowing may enhance and enlarge the sense that closure or equilibration has taken place. Even so, Piaget cautions that closure is only a temporary state, particularly if the organism is to grow and develop.

Caution is required even more so in assuming that new behaviors experimented with in the context of a therapy group or organizational setting actually reflect true shifts in psycho-socio-emotional configurations and learning. Therapy groups and

organizational settings often present artificial social situations, and unique environmental pressures to the person. What may have appeared as learning to Lewin, Kolb, et al. in the context of a T-Group, may very well have been adaptive behavior of individuals made uncomfortable by the tension and stress placed on their psyches. To further assume that tension, stress, and conflict is thus a prerequisite for learning is clearly disputable by the seminal research on epistemology, learning, and psychology.

Active experimentation is not required for learning to take place in the person. Learning for learning's sake may not require any form of behavioral testing out of implications. Active experimentation may not even be required for functional adaptation. This remains an issue of opinion and argument. What may be required to complete transformation of experience into forms of knowing is *transmission, expression, and recognition*. These can take a variety of forms, both extension and intension in directionality. If Experiential Learning Theory is to remain consistent to the fundamentals of learning theory, as a discipline in and of itself, it needs to redefine the last mode in such a way to allow for all forms of knowing which are available through learning.

Mary Parker Follett said that the real purpose of learning is to “increase freedom – the free range of activity and thought and power of control.” (Follett, 24:304) As it is, Experiential Learning Theory serves only to facilitate functional adaptation, and not the free range of activity and thought which is available as learning.

### Position Statements

The following position statements can now be made as a result of the research and examination of the four modes of Experiential Learning Theory, and the Experiential Learning Model.

- 1) All four modes as presently depicted are not *essential* for learning to take place, though with substantive revision, they could represent actual learning activities more accurately.
- 2) The modes of concrete experiencing and abstract conceptualization are *not* appropriately placed on a continuum of knowing, as knowing emerges as a result of the full transformation of experience, involving all the faculties of consciousness.
- 3) The modes of reflective observation and active experimentation are *not* appropriately placed on a continuum of transformation, as it has been demonstrated that inherent in the constitutive nature of *each of the four modes* are constructive transformations and structuring activities.
- 4) The modes of reflective observation and active experimentation are *not* appropriately distinguished as “intension” and “extension” respectively, as it has been demonstrated that inherent in each of these modes are activities directed *both* inward toward the person and outward toward the environment. Intension and extension are directionalities constitutive of both modes.
- 5) Active experimentation is *not* inclusive of all forms of active expression which could serve to make forms of knowing resultant from learning apparent. Active experimentation represents only one form of externalized behavioral expression. In its current portrayal of active experimentation, Experiential Learning Theory sets up conditions for learning which are limited to functional adaptation. It is suggested that the activities of this mode are more akin to active expression, and

that these sets of activities can take a variety of forms, both intensive and extensive in directionality.

- 6) It is apparent that the four separate modes depicted in Experiential Learning Theory are *not separate and distinct*. In fact, they are inextricably interconnected and interpenetrating. To suggest “learning requires abilities that are polar opposites and the learner, as a result, must continually choose which set of learning abilities he will bring to bear in any specific learning situation” (Kolb and Fry, 75:36) is to distort the findings and genius of Piaget, Kohler, Wertheimer, Jung, Dewey, and Lewin. The relationship between the four learning modes, at the least, must be described as reciprocal, interpenetrating, and functionally dependent. It has been demonstrated through Piaget that each mode constructs new transformation structures on the basis of what has gone before; that activities of perception and apprehension, perception and abstract conceptualization interpenetrate one another and cannot be sharply distinguished, even developmentally. Hence, a more appropriate portrayal of the *relationships between the modes* needs to be understood and presented if the Experiential Learning Theory and its Model are to possess construct validity and intellectual integrity.
- 7) Finally, it is fallacious to define learning as the result of adaptive choice. Adaptive choice results from learning. One may integrate new experience as a result of adaptive choice and learn from it, but the learning process that takes place should *not to be equated with adaptive choice*. Adaptive choice results in an object given in cognition or experience, from which structural transformations take

shape. Adaptive choice may provide the fodder for learning. But that is all. Adaptive choice does not *create* knowledge, cognition, or intuition. It is not constitutive of learning in any of the foundational sources upon which Experiential Learning Theory bases its constructs.

---

Experiential Learning Theory has depicted learning as an open system wherein sensory data from the environment enters the system of the person as concrete experiencing and exits the system of the person through active experimentation. What takes place within the universe of the cycle is depicted as sharply differentiated activities that transform experience along one-dimensional parameters. The formalization of this system is demonstrated through static geometrical representations which do *not* portray the transactive or interactive activities and conditions described in the theory.

It has been demonstrated here that the four Experiential Learning Theory modes are constitutive of operational and constructive transformations which cannot be so sharply differentiated or demarcated as represented in the model. The transformation of sensation and experience through faculties of consciousness resulting in forms of knowing involve operations, transformations, and structuring activities of much greater complexity than the Theory currently explains or allows. Finally, Experiential Learning Theory attempts to integrate various philosophical, psychological, and epistemological schools of thought which have fundamentally different *domain assumptions*, in regard to the *constitutive natures* of knowledge, learning, knowing, experience, and ultimately consciousness. Hence, the contradictions and inconsistencies in the foundational

propositions and constructs of Experiential Learning Theory call into the question the validity of its models, learning styles, adaptive styles, instruments, and measures.

## SOURCES CITES AND CONSULTED

- Bandura, Albert. "The Self System in Reciprocal Determinism." *American Psychologist* (April, 1978) 344-358.
- Bateson, Gregory. Steps to an Ecology of the Mind. New York: Balantine Books, 1972.
- Beth, Evert and Piaget, Jean. Mathematical Epistemology and Psychology. Holland: D. Reidel Publishers, 1966.
- Blum, G. S.; Gewitz, P. J.; and Hencastin, L. S. "Principles of Cognitive Reverberation." *Behavioral Science* (July 1967) Vol. 12, No. 4, 275-288.
- Bronfenbrenner, Urie. The Ecology of Human Development. Cambridge, Mass.: Harvard University Press, 1979.
- Darwin, Charles. The Origin of the Species and Descent of Man. New York: The Modern Library, (1859), 1948.
- Dewey, John. Experience and Education. New York: Macmillan Company, 1938.
- \_\_\_\_\_. How We Think. Boston: D.C. Heath and Co., 1910.
- \_\_\_\_\_. Intelligence in the Modern World. New York: Random House, Inc., 1939.
- Descartes, Rene. Discourse on the Method of Rightly Conducting the Reason and Seeking Truth in the Sciences. Philadelphia: David McKay Company, (1637) 1947.
- Fleming, William D. Vocabulary of Philosophy, Psychology, Ethical and Metaphysical. Edinburgh, Scotland: The University of Endinburgh, 1886.
- Follett, Mary Parker. Creative Experience. London: Longmans, Green and Co., 1924.
- Gendlen, E. T. Experiencing and the Creation of Meaning. New York: Free Press of Glencoe, 1962.
- Gish, Glen. "Integrated Learning: A Process View." *Unpublished paper, National Institute of Education project on Life Long Learning and Adult Development, Case Western Reserve University* (January, 1979).
- Gruber, H., and Voneche, J. J. (Eds.) The Essential Piaget. New York: Basic Books, Inc., 1977.
- Hadamard, Jacques. The Psychology of Invention in the Mathematical Field. New Jersey: Dover Publishing, 1945.
- Heath, Sit Thomas L. The Thirteen Books of Euclid's Elements (translated from the text of Heiberg). New York: Dover Publications, Inc. 1956.
- Hegel, G. W. F. Science of Logic (translated by A. V. Miller). London: George Allen and Unwin, Ltd., (1831) 1967.
- \_\_\_\_\_. The Phenomenology of Mind (translated by J. B. Baillie). New York: Harper Colophon Books, (1807) 1967.
- Helson, Harry. Adaptation Level Theory. New York: Harper and Row, 1979.
- Hume, David. A Treatise on Human Nature, Book I of the Understanding (ed. by D. G. C. Macnabb) New York: World Publishing Company, (1738) 1962.
- Hunt, David E. "Person-Environment Interaction: A Challenge Found Wanting Before It was Tried." *Paper delivered to American Psychological Association, Quebec, August, 1973*.
- Huxley, Julian. Evolution: The Modern Synthesis. New York: John Wiley and Sons, 1964.

- James, William. The Philosophy of William James: Selected from His Chief Works. New York: The Modern Library, (1885 – 1920) 1940.
- \_\_\_\_\_. The Principles of Psychology, Vol I and II. New York: Dover Publications, Inc., (1890) 1950.
- Jung, Carl G. Psychological Types. Princeton, New Jersey: Princeton University Press, (1923) 1971.
- Kant, Immanuel. The Critique of Pure Reason (translated by J. M. D. Meiklejohn). London: J. M. Dent and Sons, Ltd., (1789) 1934.
- Kaufman, Walter. Hegel: Reinterpretation, Texts, and Commentary. New York: Doubleday and Company, Inc. 1965.
- Keleman, Stanley. Your Body Speaks Its Mind. New York: Simon and Schuster, 1975.
- Koffka, K. Principles of Gestalt Psychology. New York: Harcourt, Brace and Company, 1935.
- Kohler, Wolfgang. Gestalt Psychology. New York: Horace Liveright, 1929.
- Kolb, David A. Experiential Learning : Experience as the Source of Learning and Development. Englewood Cliffs, N.J.: Prentice Hall, 1984.
- Kolb, David A. Learning Style Inventory Technical Manual. Boston, Mass.: McBer & Company, 1976.
- Kolb, David A. "Toward an Integrated Model of Human Change and Growth." *Unpublished Paper, Massachusetts Institute of Technology*, 1970.
- Kolb, David A. and Wolfe, Donald M (principal investigators); in collaboration with Ronald Fry...[et al.] Life Long Learning and Adult Development Project: Final Report. Department of Organizational Behavior, Weatherhead School of Management, Case Western Reserve University, *United State Department of Education, National Institute of Education, NIE-G-77-0053* (April 1981).
- Kolb, David A and Fry, Ronald. "Toward an Applied Theory of Experiential Learning." in Theory of Group Processes. (ed. by Cary Cooper). New York: John Wiley and Sons, Inc., 1975.
- Kolb, David A.; Rubin, Irwin M.; and McIntyre, James M. Organizational Psychology: An Experiential Approach (2<sup>nd</sup> ed.) Englewood Cliffs, New Jersey: 1971.
- Kosok, Michael. "The Formalization of Hegel's Dialectical Logic." in Hegel: A Collection of Critical Essay. (ed. by Alasdair MacIntyre). New York: Doubleday and Company, 1972.
- Lewin, Kurt. Field Theory in Social Sciences. New York: Harper Torchbooks, 1951.
- Marcuse, Herbert. One-Dimensional Man. Boston: Beacon Press, 1964.
- Marx, Karl. The Poverty of Philosophy. New York: International Publishers, 1847.
- McKeon, Richard (ed.). The Basic Works of Aristotle. New York: Random House, (1941) 1966.
- Miller, James. Living Systems. New York: McGraw Hill, 1978.
- Mead, George Herbert. The Philosophy of Act. Chicago: University of Chicago Press, 1938.
- Ornstein, Robert. The Psychology of Consciousness. New York: Penguin Books, 1972.
- Piaget, Jean. The Development of Thought: Equilibration of Cognitive Structures. New York: Viking Press, 1975.
- \_\_\_\_\_. The Mechanisms of Perception. New York: Basic Books, 1969.

- Petermann, Bruno. The Gestalt Theory and the Problem of Configuration. New York: Harcourt, Brace and Company, 1932.
- Plato. The Dialogues (translated by B. Jowett). New York: Random House, 1937.
- \_\_\_\_\_. The Republic (translated by Frances. Macdonald Cornford). London and New York: Oxford University Press, 1945.
- Russell, Bertrand. The Principles of Mathematics. London: George Allen and Unwin, Ltd., 1903.
- Schmidt, Robert F. (ed.) Fundamentals of Neurophysiology. New York: Springer-Verlag, 1975.
- Schroeder, H.; Driver, M.; and Streufert, S. Human Information Processing. New York: Holt, Rinehart and Winston, Inc., 1967.
- Scott, William. "Varieties of Cognitive Integration." *Journal of Personality and Social Psychology*. (1974) Vol. 30, No. 4, 563-578.
- Simon, Herbert. Models of Discovery. Volume LIV, Boston Studies in Philosophy of Science Series. Holland: D. Reidel Publishing Co., 1977.
- Sommerville, D. M. Y. The Elements of Non-Euclidean Geometry. New York: Dover Publications, Inc., 1958.
- Torbert, William R. Learning From Experience: Toward Consciousness. New York: Columbia University Press, 1972.
- Vandenberg, Donald (ed.). Theory of Knowledge and Problems of Education. Urbana, Illinois: University of Illinois Press, 1969.
- Watson, John B. Behaviorism. New York: W. W. Norton and Co., Inc., 1924.
- Weiner, Norbert. Cybernetics. New York: MIT Press, 1961.
- Wertheimer, Max. Productive Thinking. New York: Harper and Brothers Publishing, 1945.
- Wilder, Raymond L. Evolution of Mathematical Concepts. New York: John Wiley and Sons, Inc., 1968.
- Wilson, E. O. On Human Nature. Cambridge, Mass.: Harvard University Press, 1978.
- Witkin, H. A., et al. "Field-Dependent and Field-Independent Cognitive Styles and Their Education Implications." *Review of Educational Research* (Winter, 1977) Vol. 47, No. 1, 1-64.